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BEYOND FIRST STAGE EFFECTS

By

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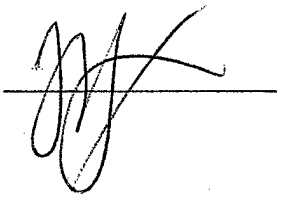
A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

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15.Abstract: A first stage effect is something that creates greater efficiency. A Second stage effect impacts how people incorporate technologies into social systems. This incorporation causes changes in traditional organization and thought that result in true revolutionary effects. Today we are moving from the industrial age to the information age. Technology and the ability to process, move, display and interpret information becomes ever more efficient. Many businesses have gone beyond first stage effects—greater efficiency—and have reinvented the hierarchical centralized decision making business structure to a flatter structure of decentralized decision making and execution. Technology has also afforded the United States military with ever more efficient weapons and the same ability to handle information as the business sector. The military has historically been (and remains) a strictly hierarchical organization. The question is what kind of military organization is required to achieve second stage effects from new technologies in a similar fashion to dominant civilian businesses of today?

This paper argues that the military can achieve second stage effects from information technologies by changing from a hierarchical organization with highly centralized decision making processes to a flatter, partially networked organization with a highly decentralized decision making process. To do this the paper looks at information age business practices that have allowed some companies to dominate their peers that are armed with similar technologies. How these dominating information age practices might translate into improvements in military organization will then be explored. The paper concludes that second stage effects can be achieved through reorganizing the military and notes any significant risks involved in changing to a flatter organization.

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Abstract

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John Arquilla and David Ronfeldt, authors of In Athena's Camp: Preparing for Conflict in the Information Age, talk about first and second stage effects during times of technological revolutions.[1] A first stage effect is something that creates greater efficiency. The machinegun, rifled artillery, airplane and tank all represented and created greater efficiency when they were first introduced into warfare. This greater efficiency resulted in mass produced death, but no decisive outcome. The full and revolutionary impact of these inventions was not realized until second stage effects took place. Second stage effects impact how people incorporate technologies into social systems. This incorporation causes changes in traditional organization and thought that result in true revolutionary effects.

The German use of the blitzkrieg in their attack on France during World War II demonstrated the devastating second stage effect of revolutionary weapons represented by the machinegun, rifled artillery, airplane and tank. German second stage effects came from new organizations and social processes represented by changes to doctrine. Today we are moving from the industrial age to the information age. Product cycles in industry have changed from periods expressed in several years to periods expressed in a few months. Technology and the ability to process, move, display and interpret information becomes ever more efficient.

Many businesses have gone beyond first stage effects—greater efficiency—and have reinvented the hierarchical centralized decision making business structure to a flatter structure of decentralized decision making and execution. Like the German

[1] Cyberwar is Coming page 2.

blitzkrieg into France in World War II, these corporations have leveraged their information technology into overwhelming business dominance. Technology has also afforded the United States military with ever more efficient weapons and the same ability to handle information as the business sector. The military has historically been (and remains) a strictly hierarchical organization. The question is what kind of military organization is required to achieve second stage effects from new technologies in a similar fashion to dominant civilian businesses of today?

This paper will argue that the military can achieve second stage effects from information technologies by changing from a hierarchical organization with highly centralized decision making processes to a flatter, partially networked organization with a highly decentralized decision making process. To do this the paper will look at information age business practices that have allowed some companies to dominate their peers that are armed with similar technologies. How these dominating information age practices might translate into improvements in military organization will then be explored. The paper will conclude that second stage effects can be achieved through reorganizing the military and note any significant risks involved in changing to a flatter organization.

Haim Mendelson and Johannes Ziegler in their book, Survival of the Smartest developed a model to rate the organizational IQ of a business. Their model revolves around five concepts that can be measured through survey.[2] The five factors are:

[2] Survival of the Smartest, information describing high IQ organizations is condensed in the paragraphs that have been indented with hyphens. This information is drawn from pages 3-125 of the book.

-External Information Awareness: Ensuring that each part of the organization captures the external information it needs quickly and accurately. This includes listening to customers as well as competitors. High IQ companies are constantly scanning the external environment. Many times the high IQ company makes the customer a partner. High IQ companies constantly compare themselves to their competition and to other outstanding organizations if they are in other businesses. In contrast, low IQ companies are generally internally focused and may consider the customer a nuisance. Little effort is made to learn from the external world.

- Effective Decision Architecture: Ensuring decisions are being made at the right level, that is by the people with the best information perspective. High IQ companies feel that decision authority and knowledge go hand in hand. The power to make decisions is given to those with the best knowledge. There is not time for intelligence to be passed up through several layers of hierarchy to a centralized decision maker and then be passed all the way back through the organization for action to begin. Instead the high IQ organization makes information available to all levels of the organization which pushes real power down to the lowest levels. This includes decisions to expend resources. This causes resources to be pushed down and not held in reserve or in excess inventory. This process allows for improved speed and quality of decisions as well as creates a sense of ownership at the lowest levels of the organization. In contrast a low IQ organization loses time waiting for permission from higher management and hordes resources. Excess inventory and resources are held in reserve as a hedge for safety.

- Internal Knowledge Dissemination: Ensuring that each part of the organization knows what it needs to when it needs to know it. Knowledge dissemination takes place both horizontally and vertically, across geographic boundaries over time. High IQ companies create cross-functional teams that stay together and work to eliminate stove pipes or compartments. Individuals are committed to the team and team goals. Knowledge is shared and accessible through common information technology systems. Knowledge is seen as power, so sharing knowledge throughout the organization causes power to be pushed down to the lowest levels. Physical, geographical, functional and hierarchical barriers that impede information flow are torn down. The low IQ company treats access to information as privileged and knowledge is withheld from lower levels in the organization. Information systems within the low IQ organization are usually not compatible across the organization. Special systems are developed for the high level executives and the remainder of the organization has limited access to information technology. Information Technology is used to support the traditional structure so power can remain concentrated. The teams used in low IQ organizations tend to be short term and a team member's main function tends to be "protect your turf".

- Organizational Focus: Fighting information overload and organizational complexity by limiting the scope of the business and simplifying structures and processes. In a high IQ company bigger does not mean better. These companies have smaller but highly profitable product lines that focus on "hit products". The key is to

focus on core competencies and outsource to partners all other functions. Low IQ companies lack focus and tend to own the majority of the manufacturing process.

- Information Age Business Network: Recognizing that one company cannot create value on its own; that it needs to operate as part of a network. In managing partnerships high IQ companies apply the four previous principles of high IQ management to their entire business network. These types of networks allow for "just in time" efficiency. This allows for holding little or no inventory. What matters to high IQ companies is not a steady flow of supply, but flexibility to meet demand as required. Suppliers become partners. Collaboration may even occur between competitors to achieve greater efficiencies. Quality in partners is desired over quantity. This quality is improved through constant honest evaluation through short feedback loops, which are enabled through sharing of common information technology systems. Much of the evaluation is self-evaluation so trust among partners is vital. Low IQ companies look on upon suppliers not as partners, but as adversaries. Suppliers, competitors and even individuals or groups in different hierarchical levels are not trusted.

Mendelson and Ziegler's study showed companies that grew faster and were more profitable had a distinctively higher IQ score relative to their peers. The high IQ companies showed accelerating rates of growth and higher returns on investment compared to their low IQ counterparts. Mendelson and Ziegler's concept of IQ is the capability of either an organization or an individual to process information quickly, come up with effective decisions and implement them. This concept of speed has driven

product lifecycles (period of time until a product is replaced by an upgraded and better version). In the personal computer industry for example, product cycles have fallen from 19 months in 1989 to 6 months in 1997.[3] High IQ companies learn quickly and are able to adapt to rapid change. In contrast low IQ companies tend to not learn and act reflexively. Low IQ solutions to ills are normally greater amounts of the same medicine, which is failing in the first place. The approach to World War I trench warfare provides a good example of low IQ solutions. Attacks that failed were followed by similar attacks that simply increased the volume and duration of artillery bombardment and applied more masses of men. These attacks generally resulted in failure, but on a more colossal scale.

The Rand Corporation study, "The Virtual Corporation and Army Organization" further highlighted phenomena relating to successful information age business practices and concepts. The study noted the shift from mass production by low skilled workers, centrally controlled to a knowledge-based model. The knowledge-based model employs small numbers of highly skilled workers that have more autonomy. The knowledge-based system produces a wide variety of complex and highly customized products.[4] The industrial model was a no trust system relying on strict rules and short spans of control by several layers of management. The system was designed to control large numbers of poorly educated and unskilled workers. In contrast the Information age model is built on trust and decentralized control. It uses brain force over industrial age brute force.[5]

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[3] Survival of the Smartest page 2.
[4] The Virtual Corporation and Army Organization, page 4.
[5] War and AntiWar, page 9.

Drawing from Mendelson and Ziegler and the Rand Corporation study the successful information age corporation generally is organized to have short feedback loops that allow for rapid learning. Greater knowledge throughout the entire organization is the key to learning and learning is the key to increased adaptability. Knowledge is gathered from both external and internal sources and made available at all levels. Decentralized organization allows for faster and better decisions being made. Decentralized decision making is based on trust and trust is possible at lower levels because of a more knowledgeable workforce that is focused on very specific goals. Greater agility derived from better and faster decisions allows for less hedging. Resources are not held in reserve or as excess inventory. Greater efficiency is obtained through better organizational focus. The organization does not have to be an expert in every aspect of their business. The organization needs in stead to be an expert on determining and executing core competencies and finding out who are the best groups to do the rest. Quality partnerships and collaboration are sought. Customization to meet specific requirements for a specific time frame allows for production of high quality goods and services at low cost.

It is clear that some corporations have harnessed information technology to achieve dominating effects in the business world. Companies barely a decade old such as Microsoft, Cisco Systems and Oracle have attained market capitalizations greater than Industrial Age giants such as General Motors. Knowing how some businesses have changed in concept and organization to leverage new technologies, the question arises as to how military organizations and concepts can be changed to gain similar superior

results vice incremental gains in efficiency. Without organizational superiority superior technology or weapons only have tactical significance.[6] The German dominance in France during Germany's 1940 Blitzkrieg is illustrative. Although British and French tanks were superior to their German counterparts, superior German organization trumped technology. German organizational structures were flatter and control was more decentralized. Mobile radios were placed in all tanks vice just the commanders tanks so that information and coordination could take place in a lateral almost network fashion. In contrast, the Germans exploited the allied hierarchical system by knocking out the few radios that linked battlefield commanders to higher headquarters.

The typical military organization model is hierarchical. Information age business models used flattened, virtual or network organizations overlaid by some hierarchical structure. How do we get a flatter, virtual or networked military organization? Is one of these models best or is there room for some elements of a hierarchical organization? Although similar there are subtleties to each of these types of organizations. Flatter and virtual designs are closer in concept. The network design provides the most decentralization and is the most radical of the three models.

A flatter organization has to reduce echelons of command. Responsibilities of eliminated management or leadership positions are pushed either up or down to remaining echelons.[7] Functions that do not add value are removed. The more layers in a hierarchy, the more time it takes to move information and decisions up and down through

[6] In Athena's Camp: Preparing for Conflict in the Information Age page 70.
[7] The Virtual Corporation and Army Organization, page 8.

the system. Along the movement up and down through each layer, information tends to get distorted so that not only is the decision late; it is also of poor quality.[8] Fewer levels of information to move also means shorter feedback loops, which equates to faster learning within the organization, which yields even greater magnitudes of efficiency. This reduction in echelons of command creates a greater span of control for the senior commander. This greater span of control is handled by more focus on strategic vision and less meddling in details of day to day operations.

The idea of flattening the military organization is not a new concept. Napoleon flattened his own organization by eliminating all echelons of command between himself and his separate corps.[9] A broader span of control for Napoleon was possible because each corps was trained to act autonomously and not to wait for direction. This implies a greater reliance on training and quality in subordinate leaders. It also implies greater trust in subordinate decision making ability. The high quality and quantity of decision and execution cycles that result from decision making and execution at a level closer to the action, overcomes some mistakes that will inevitably occur. This hearkens back to the "high IQ" business principle that the person, group or team with the best information makes the decision. Great advantage over adversaries in terms of speed of decision and execution is realized as long as higher level command provides "topsight" in the form of an intent or vision framework that contains a clear understanding of what is to be achieved and why.

[8] Ibid. page 10.
[9] Ibid. page xi.

Colonel Douglas MacGregor of the US Army has written on reorganizing the Army and believes that "...flattening the Army's warfighting organization between the corps nucleus of the Joint Task Force and the battalion battlegroup is essential."[10] He envisions the elimination of the division as a warfighting echelon. Instead the Corps would provide the nucleus of a Joint Task Force command with modular combat groups tailored to provide various functions. These combat groups would be self-contained and self-supporting and capable of autonomous action. Colonel MacGregor shows how groupings can be reorganized from the existing 10 division structure into a more flexible, deployable, force that provide a wider range of options to the regional Commanders in Chiefs.[11]

A similar flattening is possible in other service organizations by removing echelons of command that do not add useful combat value to the organization. The Marine Corps has modularized its air wings, divisions and logistical support groups into easily task organized pieces. Even within this modular format there is room for flattening. The division and wing are rarely deployed and may have little value as a separately maintained echelon of command. The largest Marine Air Ground Task Force is a Marine Expeditionary Force, which is built around a wing and division structure and a large combat service support element. A larger force could be deployed using the Marine Expeditionary Force to control multiple task organized brigade elements built on a similar Marine Air Ground Task Force model. This eliminates the division/wing echelons of command in favor of more useable modules. The brigade staff organizations

[10] Breaking the Phalanx: A New Design for Landpower in the 21st Century, page 74.
[11] Ibid. page 81.

could be built on savings from the division and wing staffs and from consolidating more battalions and squadrons into fewer regimental headquarters and aviation groups. Varying the size of battalions (some of which would be smaller than current battalions) allows for creation of more battalions. More battalions in turn allow for a more efficient deployment and training cycle. The Air Force and Navy may also have echelons of command that are rarely used and could be eliminated. If there is limited practical value added by extra layers of command those layers need to go. The best business models have ruthlessly eliminated any layer or function that does not add significant and constant value.

The trend over time is toward smaller combat formations. Colonel MacGregor in his book Breaking the Phalanx, notes that the historical trend has been towards smaller, more integrated all arms combat formations. The 1750 all arms Field Army had about 50,000 troops. By 1805 Napoleonic Corps had from 30,000 to 50,000. In 1914 the all arms formation had evolved into Divisions, which numbered 28,000. The Panzer Division of 1940 had 14,000 troops and the US Army's Combat Command had shrunk to 4,000 to 5,000 in size by the end of the war.[12] In his book, MacGregor argues the current US Army's ten divisions of 11,000 to 18,000 personnel each are too large and should be reorganized into more numerous (and deployable) task organized combat groups of 4,000 to 5,000 commanded by brigadier generals.

A flatter organization not only has fewer layers, but also fewer planners on staffs. This would include the ever-increasing joint staff and service headquarters. The size of

staffs can be reduced through use of information age business practices. Some staff functions may be better served by consolidating. This may allow for better and faster integration of information and internal knowledge dissemination. Colonel MacGregor recommends combining the J-2 and J-3 staff functions into one grouping.[13] Special Operations Command has already successfully implemented a similar concept. There may be other logical compressions. Planning groups must be small. Bill Gates of Microsoft Corporation commonly finds himself saying, "Why are there so many people in this room?"[14] His view is that if there are more than three or four decision-makers at a meeting the extra people become part of the problem vice part of the solution. The extra personnel are better serving the organization by being out solving problems. Reduction in the number, frequency and quality of meetings is obtained through better preparation through remote sharing of information. Reduction in the overall "mass" of the joint staff by getting rid of echelons of higher management and positions that do not add significant value creates a leaner more efficient organization. This reduction in overhead frees up personnel for new positions that add more value to military core competencies.

There are other ways to flatten an organization. Virtual organizations get flatter by outsourcing. Businesses look at core competencies—the things that make the company unique. Functions that fall outside the core competencies are candidates for outsourcing to companies with "best in the world" competencies in those areas.[15] There are many non-combat functions in the realm of administration, fiscal and infrastructure

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[12] Breaking the Phalanx: A New Design for Landpower in the 21st Century, page 53.
[13] Ibid. page 81.
[14] Business @ the Speed of Thought page 100.
[15] The Virtual Corporation and Army Organization, page 15.

support that could be handled more efficiently by companies outside the military that focus on those things for a living. There are some tactical functions the military is currently involved in that may be better accomplished by outsourcing. These functions fall into the area of civil security (police type functions) and nation building. Some candidates for potential outsourcing include logistical support, police enforcement and police training. These capabilities could be contracted and controlled by the state department in various operations other than war scenarios. Many non-government organizations may as well be able to provide contract services that help replace combat forces that would be more appropriately applied elsewhere. Some places may be so unstable as to require some type of back up offensive capability or reaction force. Outsourcing this mission to forces more akin to the region vice US troops might provide a cheaper, more culturally sensitive and better solution. The reserves have provided a means of outsourcing capability not required on a regular basis. Some of the capabilities in the reserve such as civil affairs, psychological warfare units and logistic capability may be required on a more regular basis and need to be in the regular force. Heavy armored forces on the other hand are needed very infrequently and represent excess inventory. These heavy forces might be almost totally outsourced to the reserves.

A network organization is the furthest removed from hierarchical structure.[16] The pure network structure is similar to a biological system. A biological system may have no controlling centers, but still exhibit complex behavior. The Rand Corporation publication "The Virtual Corporation and Army Organization" provides the examples of the action of a swarm of bees or functioning of the human brain. Both exhibit complex

behavior, but have no controlling center. These systems are very adaptive to local conditions and rapid changes. Helpful and harmful information passes quickly throughout the network.[17]

For practical use in business, networks are usually overlaid on some type of hierarchical structure. Revolutionary wars using guerrilla or irregular warfare have typically had a network type structure overlaid by some form of hierarchy. These organizations have proven more survivable than organizations built around a strict hierarchy. In a very hierarchical organization, destruction of the higher echelons of command normally causes rapid collapse of the remaining organization. The fall of France in 1940 provides an excellent example of such a collapse.[18] Networked guerrilla organizations have proven highly adaptive (one of the characteristics of a network) and hard to destroy. Hierarchies have a difficult time fighting networks. There are very few examples of successful counter insurgency operations. Guerrilla war inverts the principle of concentration. Dispersion is an essential condition of survival and concentration is of limited value. Concentration occurs only for brief periods for a specific purpose, which makes the network hard to strike.[19] Terrorist groups use similar methods of operation. Network type organizations are best used against other networks.

A networked military organization on a large scale is not new and not necessarily reliant on technology. John Arquilla and David Ronfeldt in their article "Cyberwar is

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[16] The Virtual Corporation and Army Organization, page 17.
[17] Ibid.
[18] In Athena's Camp: Preparing for Conflict in the Information Age page157.
[19] Strategy, page 365

Coming" point to Genghis Khan and Mongol warfare in the 12th and 13th centuries as an example of a large scale network warfare. Mongol warfare was based on decentralized operations, superior knowledge, faster relaying of knowledge via the use of arrow riders (using a string of spare horses) and greater mobility.[20] Through a superior network of reconnaissance, mobility, communications and decentralized execution the Mongols avoided enemy strength and defeated opponents piecemeal. The sense of surprise, shock and isolation was so great that many times large-scale enemy surrender was obtained without fighting.[21]

Lateral communication or communication between nodes is more important than vertical communication in a network. Information technology allows networks consisting of small organizations, sub-elements and even individuals to operate across greater distances with timely and high quality information.[22] Networks require superior intelligence, better lateral communication, smaller formations that fight independently and smarter more capable troops. The network organization is very decentralized so pushing knowledge and decision making down to lower levels enables networking. Decentralization requires a smarter better-trained work force capable of independent decision making. This type of decentralization requires more trust, trust that individuals or autonomous groups will do the right thing without supervision.

So what second stage results can be achieved by reorganizing the Armed forces along successful information technology business principles? The pay off is freeing up

[20] In Athena's Camp: Preparing for Conflict in the Information Age 34-35.
[21] Ibid.

more actual military capability to apply to worldwide scenarios in a customized fashion. The force deploys more easily because the forces are smaller and require less support. Better use of knowledge by forces and decentralized decision making allows a smaller less resource intensive force to defeat larger forces. Speed, agility and knowledge become more important than mass and firepower. Brainpower at all levels allows for the reduction of massive brawn. The flatter or networked structure supporting a smarter more experienced fighter allows for greater capabilities against irregulars, insurgents, terrorists and transnational criminals who also operate along network lines. Outsourcing non-core functions, and increasing the number of deployable combat groups allows for less time operating and more time in training and preparing for war. Outsourcing also allows for larger scale conflict along conventional lines by rapid mobilization of armor heavy reserve forces.

Smaller more mobile formations can operate with greater dispersion with better lateral communication using information technology. Better knowledge about the friendly and enemy situation allows for decentralized and faster decision making. If at the same time opposing forces are deprived friendly and enemy information, a significant advantage is gained by the side with the greatest awareness allowing for rapid transitions from offense to defense and back again in an almost seamless fashion. This whole process is akin to playing a game of chess where you can see all your pieces and your opponents pieces on the entire game board while your opponent can only see small portions of the board that you have selected. Such a game allows for the less powerful

[22] Ibid. page 83.

pieces to be come very powerful and allows victory by a few pieces over an adversary with many.[23]

Better wisdom through superior organization that maximizes information technology allows for more focused operations that yield decisive results more quickly. The information age has moved from industrial age mass production to mass customization.[24] Customization of war has been seen already in the targeting of fixed or semi fixed objects. We have witnessed the move from dozens of sorties of aircraft with significant tonnage of bombs be reduced to a single aircraft with a single bomb obtaining surer and more complete results. This leads to lower physical signatures due to smaller forces customized for specific scenarios. This smaller customized force in turn has smaller requirements for logistical support and reduced timelines for deployment. Michael Dell of Dell computers noted the change in the relationship of the importance of physical assets and knowledge.

"Physical assets used to be a defining advantage. Now they're a liability. The closer you get to perfect information about demand, the closer you can get to zero inventory. More inventory means you have less information, and more information means you have less inventory. We are trading physical assets for information."[25]

Increased business productivity using new organization and information technology has dramatically reduced the cost of producing and delivering goods and services in the past decade. Changes to military organization and use of information

[23] Cyberwar is Coming page 5.
[24] The Third Wave pages 179- 194.
[25] Business @ the Speed of Thought, page 100.

technology may as well dramatically drive down the cost of killing allowing smaller better-trained, organized and informed forces to defeat much larger units.[26]

The game of Go provides an example of how network organizations can work in a non-linear fashion. The goal in Go is to control more battlespace than your opponent. In Go there is almost never a front line, action takes place anywhere on the board at any time, all pieces are alike (there is no hierarchy of pieces as in chess) and no piece is ever totally secure.

"Go in contrast to chess is more about distributing one's pieces than about massing them. It is more about proactive insertion than about maneuver. It is more about deciding where to stand than whether to advance or retreat. It is about developing web-like links among nearby stationary pieces than about moving specialized pieces in combined operations. It is about protecting networks of pieces than about protecting hierarchies of pieces. It is more about fighting to create secure territories than about fighting to the death of ones pieces. Further there is a blurring of the offense and defense—a single move may attack and defend simultaneously. Finally the use of massed concentrations is to be avoided. ...This is quite different from chess, which is generally linear, and in which offense and defense are usually easily distinguished and mass is a virtue. Future war will likely resemble the game of Go more than the game of chess"[27]

The game of Go implies that power is not concentrated in large and powerful weapons, but instead is derived through more thoughtful placement of pieces and better teamwork. Concentrated power becomes a liability and distributed power becomes dominant. The power massed in a single carrier potentially becomes a liability (a concentrated target vulnerable to attacked and total loss) and the power of small teams working together over a large area becomes potentially dominant.

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[26] In Athena's Camp: Preparing for Conflict in the Information Age page 113.
[27] In Athena's Camp: Preparing for Conflict in the Information Age page 11.

An adaptive network of dispersed nodes can also use the principle of mass by the concept of swarming. Instead of linear waves of forces that are tightly controlled, the dispersed forces "swarm" from multiple directions to converge in a massed attack and then quickly disperse again.[28] Instantaneous sharing on knowledge and decentralized decision making allow for these rapid transitions from offense to defense from swarm to dispersal. Centralized planning (except for broad strategic planning) and control is not possible and decisions to bypass, swarm or disperse become almost intuitive based on knowledge of intent and superior situational awareness of the battlespace.

Even though reorganization to flatter or networked structures will allow effective employment of smaller, smarter and more lethal forces that are more survivable, there are significant risks involved in changing existing organizations to achieve second stage effects. The major dangers fall into three categories. First, a change to a more decentralized organization requires greater trust and the potential for more mistakes. Second, creating a flatter organization removes some echelons of command so training opportunities for higher echelons of command are limited. Third, overwhelming mass may still crush smaller, but more knowledgeable fighting organizations.

The key to greater trust is the willingness to accept some mistakes. Smarter people that are better trained, experienced in their jobs and have access to knowledge will reduce mistakes to a low volume. Increased speed in making a greater number of quality decisions offsets a low volume of mistakes. So mistakes must be expected and allowed. Quick adaptation to turn a mistake into a new advantage is derived from freedom to make

[28] Comentarios Sobre la Guerra de Red Zapatista pages 320-346.

autonomous decisions. This system puts a premium on education and training. Better education and training require a commitment of time and resources. Reorganizing to a more efficient structure yields time and resources that can be applied to improving training. Longer periods in command of combat groups may offset the experience lost by removing some higher echelons of command. Dangers from loss of mass can be reduced through extensive experimentation and honest evaluation prior to implementation of new organizations. The Germans during the years that followed WW I experimented extensively with new organizations and doctrines. After significant experimentation it may well be found that some of these concepts may not work particularly at the higher end of the spectrum of conflict. The US Joint Forces Command is already doing some experimentation and is a logical candidate for continued experimentation supported by the individual services.

Moving away from labor and capital intensive industrial age organizations designed to optimize the production capacity of masses of unskilled workers to an information age organization built around knowledge will take time. Many of the business organizational principles such as outsourcing and business information networks are already being used and creating greater efficiency. Further reorganizing our forces to allow for fast, decentralized, quality decision making and a high level of customization can leverage fewer resources into second stage capabilities that do not currently exist.

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